Radio data modem CDA 70
USER´S GUIDE

ISO 9001:2001

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Used symbols

Danger – important notice, which may have an influence on the user's safety or the function of the device.

Attention – notice on possible problems, which can arise to in specific cases.

Information, notice – information, which contains useful advices or special interest.

Conel s.r.o., Sokolska 71, 562 04 Usti nad Orlici, Czech Republic
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1. Safety instructions

Please observe the following safety instructions:

- The communication module has to be used in accordance with all applicable international and national laws or any special regulations that may govern its use for particular applications and devices.
- Use only the original Conel company accessories. Thus you will prevent possible health risks and damage to the devices and ensure compliance with all relevant provisions. Unauthorised adjustments or use of unapproved accessories may result in damage to the module and breach of applicable laws. Use of unapproved adjustments or accessories may lead to cancellation of guarantee, which has no effects on your legal rights.
- Voltage on the communication module supply connector shall not be exceeded.
- Do not expose the communication module to extreme conditions. Protect it from dust, moisture and heat.
- It is recommended not to use the communication module at petrol stations. We remind users to observe the limitations of radio devices use at pump stations, chemical plants or where explosives are being used.
- You have to be extremely careful when using the communication module in proximity to medical devices, such as pacemakers or hearing aids.
- It is recommended to create a proper copy or backup of all the important settings saved in the device's memory, to database by help program Radwin, reference [1].

2. Description of the CDA70 radio modem

2.1. General

The CDA70 radio modem is a device for wireless data transmission. Communication between two radio modems is a simplex one and is carried out on a single frequency. Modems work in frequency band of 143 to 174 MHz (CDA70V) and 403 to 470 MHz (CDA70U). Transmission rate is 21.7 kbit/sec when using the FFSK modulation and channel spacing 20 and 25 kHz or 10.8 kbit/sec when using channel spacing 12.5 kHz. Transmission rate is 10.8 kbit/sec when using the GMSK modulation and channel spacing 20 and 25 kHz or 5.4 kbit/sec when using channel spacing 12.5 kHz. Transmission power output of the radio modem is adjustable from 10 mW to 5 W.

The CDA70 radio data modem is controlled by a 32-bit communication processor providing communication on the radio channel and individual interfaces. The CDA70 modem has four serial data interfaces (communication ports) and one with direct attachment of input/output peripherals for data collection and CIO technological process control. It is possible to set transfer parameters and communication protocol separately for each port. As a result, you may use the radio modem to communicate with various user interfaces using different communication protocols on the serial interface.

The communication protocol used for communication between modems on the radio channel provides for access of the modem to the radio channel, collision solving, retranslations and other functions necessary for cooperation of modems within a radio data network. It allows creating of a large network on a single radio channel and independent operation of multiple radio networks on a single frequency. The radio data modem CDA-70 is possible to use in combination with other modems of the system AGNES. Description of the system AGNES is in reference [2].

2.2. Examples of possible applications

- Security systems
- Telematics
- Telemetry
- Vending and dispenser machines

2.3. Description of individual components

2.3.1. Radio component

Working frequency of the radio component is synthetizer-controlled separately for reception and transmission. It is tuneable within a broad frequency band (see Technical parameters table). Several levels of the radio module transmitter power output can be set (from 10 mW to 5 W). The controlling microcomputer program controls setting of the working frequency and transmitting power output. The radio module supplies the microcomputer with information on the radio signal level being received (RSSI – Received Signal Strength Indicator). This information is used for measuring of the signal strength between individual nodes of the radio network.

2.3.2. Modem component

The modem part converts digital bit flow from the microcomputer to the FFSK or GMSK analogue modulation, which is brought to the transmitter of the radio data module. And vice versa, it converts analogue signal from the receiver to digital bit flow to the microcomputer. The modem part is designed on the basis of a CML integrated circuit.

2.3.3. Microcomputer

The base of the radio data modem controlling microcomputer is represented by a 32-bit processor with 1 MB of RAM, 512 kB of FLASH ROM and real time clock circuit with a back-up power supply.

On one side, the microcomputer is connected to the radio data module via the modem component; on the side of user interface, it is connected to circuits generating signals within the RS232, RS485, MBUS or Ethernet standard levels. The microcomputer provides for connection of up to four user interfaces. All ports are terminated by RJ45 connectors marked PORT1, PORT2, PORT3 and ETH. All RS232 ports are protected against overvoltage incoming via data cable. If a device with RS485 interface is to be connected, a level converter suitable for the appropriate application can be connected to the serial port. Different converters will be used in case of connection on a short distance or in case galvanic separation is necessary. The modem's microcomputer can be set for necessary control of the converter (RS485). To each interface, a device with different communication protocol can be connected - i.e. the microcomputer can also work as a converter of protocols between individual serial ports. The wide range of radio modem functions can be set via any of RS232 communication ports.

In addition, the microprocessor manages numerous functions of servicing and installation purposes. Apart from other important information, the microcomputer memory records data transmission statistics, strength of signals from individual radio modems, statistics of communication on individual serial ports, power failures, voltage of backup power source and temperature inside the radio data modem. See **Service manual** for description of service functions.

Configuration of the CDA70 radio data modem is stored in the permanent FLASH ROM memory. See the **Configuration of radio modem** chapter for description of its settings.

2.3.4. Inputs and outputs for telemetry

As an option, customers may wish to install inputs and outputs for data collection and controlling of technological processes in the radio modem. These signals are then led to an RJ45 connector marked **I/O**. Five signals are led to this connector. Each of them can be used either as input or output. Input is analogue 0 to 5V or digital with adjustable threshold. The output is an open collector able to switch up to 500 mA. Reading and control of I/O signals is possible both via the radio data network and from any serial RS232 interface. Two radio data modems can make up a simple technology control, where changes on one modem input signals can control remote output signals of the other modem and vice versa.

For multi-purpose usage, we supply an interface between the I/O connector and the technology providing configurable voltage and current inputs, inputs for resistance measurement (thermometers, barometers etc.), binary inputs with optical isolation and relay

outputs. With the equipment you may establish simple telemetry at low cost, without the use of industrial control automat.

2.3.5. User interface protocols

For user interface, a range of standard protocols is implemented:

- AT modem
- PROFIBUS
- MBUS
- MODBUS
- Asynchronous transparent line
- Transparent bus
- Sauter
- IWKA
- SBUS
- RADOM
- RDS

New protocols, currently not supported by the radio modem, can be implemented according to the customer's needs.

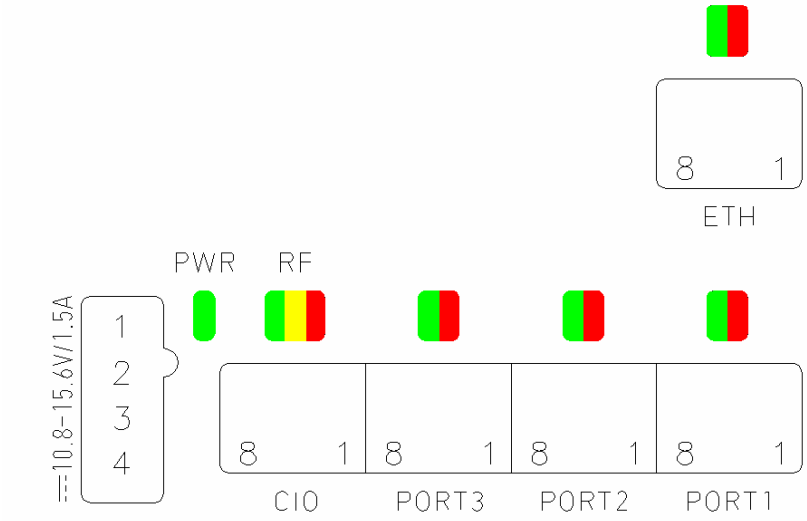
2.3.6. Technical parameters

Frequency band		143 – 174 MHz (CDA70V version) 403 – 470 MHz (CDA70U version)
Adjustment of working frequency		program
Adjustment of working frequency of receiver and transmitter		separate for each part
Adjustment of channel spacing		12.5, 20 and 25 kHz – program
Output power		10 mW to 5W – program setting
Receiver sensitivity for 10 dB SINAD		-100 dBm FFSK -105 dBm GMSK
Reception / transmission switching time		< 4 msec
Maximum transmission rate		21.7 kbit/sec for channel spacing of 20 and 25 kHz 10.8 kbit/sec for channel spacing of 12.5 kHz
Type of modulation		FFSK, GMSK
Radio modem complies with standards:	Radio parameters EMC Power safety	ETSI EN 300 113-2 V1.1.1:2002 EN 301 489-5:2001, EN 55022:2001, EN 61000-3-2:2001 EN 60 950:2001
Temperature range	Operation Storage	-20 °C to +55 °C -40 °C to +85 °C
Supply voltage (car dashboard)		+10.8 to +15.6V DC
Current	Reception Transmission 5 W Stand by	190 mA 1500 mA 25 mA
Dimensions		43x104x98 mm (DIN35 attachment to board)
Weight		600g
Antenna connector		BNC – 50 Ohm
User interface	PORT1 PORT2 PORT3 ETHERNET I/O	See. chapter 2.5.1 See. chapter 2.5.2 See. chapter 2.5.3 See. chapter 2.5.4 See. chapter 2.5.5

2.4. Radio modem status indication

Seven LED status indicators informing of the radio data modem status are located on the front panel. They are arranged in three arrays:

Colour	Group		Meaning
GREEN	PWR		Flashing once a sec…….proper function Flashing 10 times a sec. ……..power of radio module off Permanently on ..... error Permanently off ..... no power +12V Double flashing …. data reception on VF channel, level <- 100dBm
RED	RF	TX	Modem is sending data to radio channel
YELLOW		RX	Receiving synchronisation or data from radio channel
GREEN		DATA	Data received from radio channel are intended for this modem
RED	PORT1-PORT3, ETH	TX	Transmission to one of serial ports (PORT1 ... PORT3, ETH)
GREEN		DATA	Modem is receiving correct data from one of serial ports (PORT1 .. PORT3, ETH)



2.5. User interfaces (connectors)

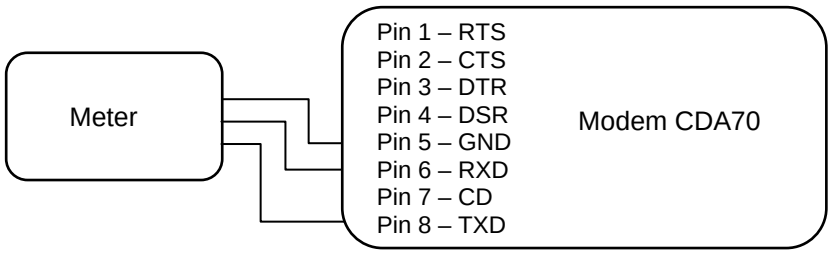
The rear panel of the radio modem contains up five RJ45 connectors. Four data interfaces are labelled PORT1, PORT2, PORT3 and ETH. The fifth connector with I/O label is intended for direct connection of inputs/outputs for data collection and technology control. The technology control and data collection can be supplied as an optional accessory upon request of the customer.

2.5.1. Connection of PORT1, PORT2 and PORT3 connectors (RS232)

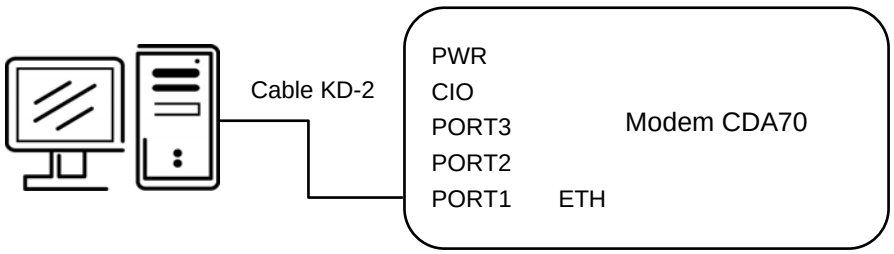
(RS232 – DCE – Data Communication Equipment)

Pin number	Signal mark	Description	Data flow direction
1	RTS	Request To Send	Input
2	CTS	Clear To Send	Output
3	DTR	Data Terminal Ready	Input
4	DSR	Data Set Ready - connected to +12V through 560 Ohm resistor	Output
5	GND	GROUND - signal ground	
6	RXD	Receive Data	Output
7	CD	Carrier Detect	Output
8	TXD	Transmit Data	Input

Circuit example of the meter with modem CDA70:

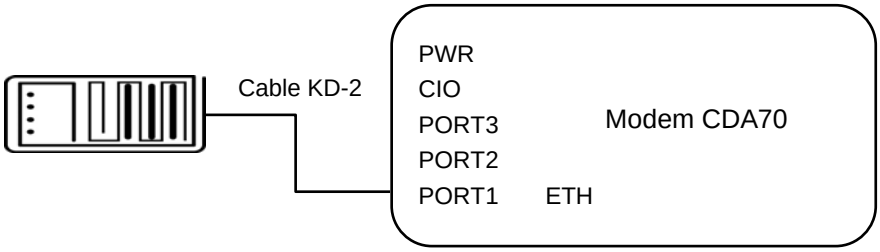


Circuit example of the PC with modem CDA70:



- the cable KD2 is connected to serial PC port (example COM1)

Circuit example of the RS232 equipment with modem CDA70:



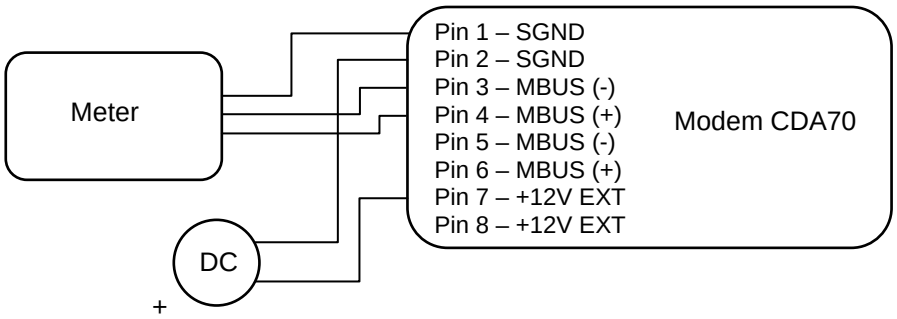
2.5.2. Connection of PORT1 connectors (MBUS)

Panel socket RJ45

Pin number	Signal mark	Description	Data flow direction
1	SGND	Signal and supply ground	
2	SGND	Signal and supply ground	
3	TxRx-	MBUS B (-)	Input/Output
4	TxRx+	MBUS A (+)	Input/Output
5	TxRx-	MBUS B (-)	Input/Output
6	TxRx+	MBUS A (+)	Input/Output
7	+12V EXT	External power supply +10,8 ÷ +15,6V	
8	+12V EXT	External power supply +10,8 ÷ +15,6V	

ATTENTION! External supply is for converter MBUS!
The converter must have external power supply because of galvanic separated.

Circuit example of the meter with modem CDA70:



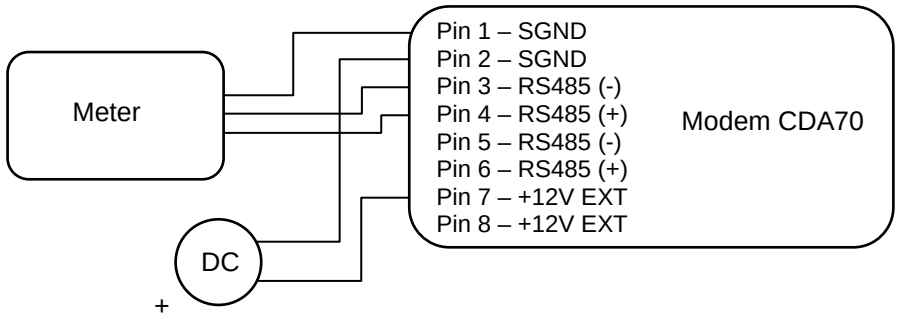
2.5.3. Connection of PORT2 connectors (RS485G)

Panel socket RJ45

Pin number	Signal mark	Description	Data flow direction
1	GND	Signal and supply ground	
2	GND	Signal and supply ground	
3	TxRx-	RS485 B (-)	Input/Output
4	TxRx+	RS485 A (+)	Input/Output
5	TxRx-	RS485 B (-)	Input/Output
6	TxRx+	RS485 A (+)	Input/Output
7	+12V EXT	External power supply +10,8 ÷ +15,6V	
8	+12V EXT	External power supply +10,8 ÷ +15,6V	

ATTENTION! External supply is for converter RS485G!
The converter must have external power supply because of galvanic separated.

Circuit example of the meter with modem CDA70:



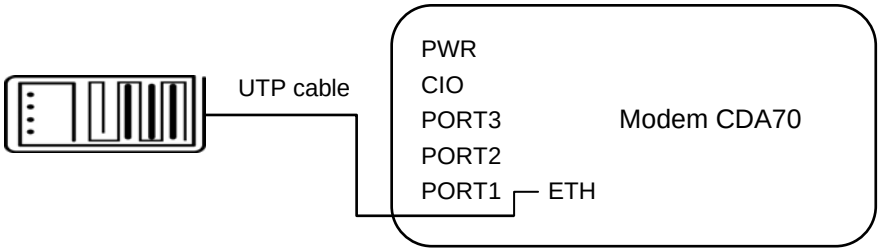
2.5.4. Connection of ETH connectors (ETHERNET)

Panel socket RJ45

Pin number	Signal mark	Description	Data flow direction
1	TXD+	Transmit Data	Input/Output
2	TXD-	Transmit Data	Input/Output
3	RXD+	Receive Data	Input/Output
4	DNC	---	
5	DNC	---	
6	RXD-	Receive Data	Input/Output
7	DNC	---	
8	DNC	---	

ATTENTION! Port ETH is not with POE (Power Over Ethernet) compatible!

Circuit example of the CDA70 with to equipment with Ethernet:

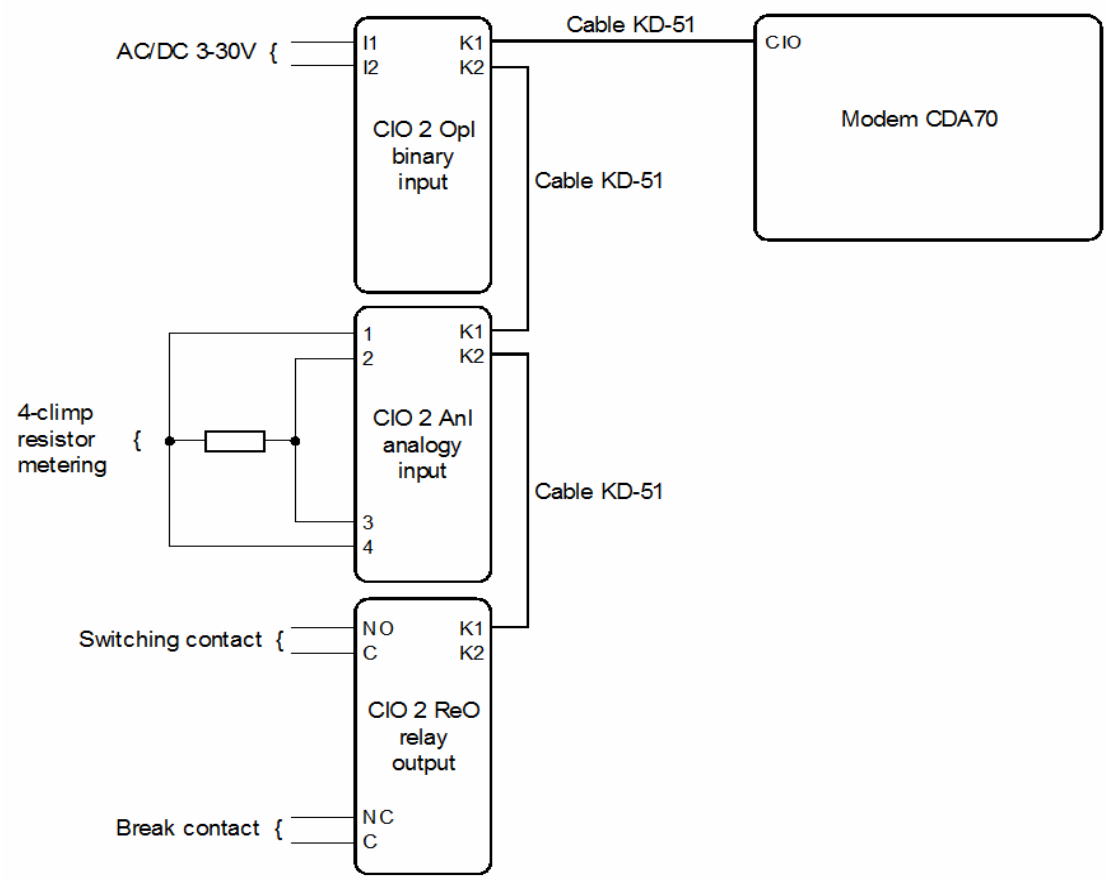


2.5.5. Connection of I/O connector

Panel socket RJ45

Pin number	Signal mark	Description	Data flow direction
1	I/O 5	Input/Output - analogue or binary input or binary output (open collector)	Input/Output
2	I/O 4	Input/Output - analogue or binary input or binary output (open collector)	Input/Output
3	I/O 3	Input/Output - analogue or binary input or binary output (open collector)	Input/Output
4	+12V	Output + 12V for supply of other circuits (connected directly to modem supply)	Output
5	GND	Signal and supply ground	
6	I/O 2	Input/Output - analogue or binary input or binary output (open collector)	Input/Output
7	I/O 1	Input/Output - analogue or binary input or binary output (open collector)	Input/Output
8	Service	For servicing purposes only	Input/Output

Circuit example of the meter with modem CDA70:



2.5.6. Power supply connector (PWDD)

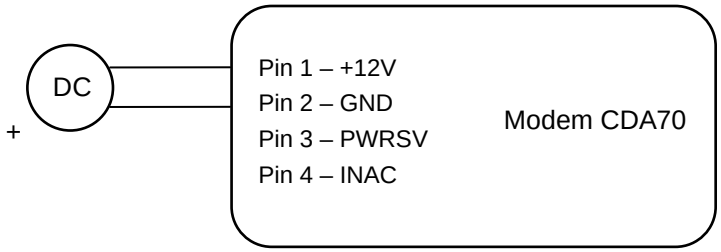
Pin number	Signal mark	Description
1	+12V	Positive pole of supply voltage
2	GND	Negative pole of supply voltage
3	PWRSV	Open collector output (Power Save) for controlling of supply voltage of the whole radio modem, see chapter 3.4
4	IN1	Input -power failure supervision. (Analogue input 0-16V)

On the power supply connector it is possible to use the signal INAC (NAP230) for present AC voltage monitoring for power supply (it can be functional only in case of supply accumulator backup).

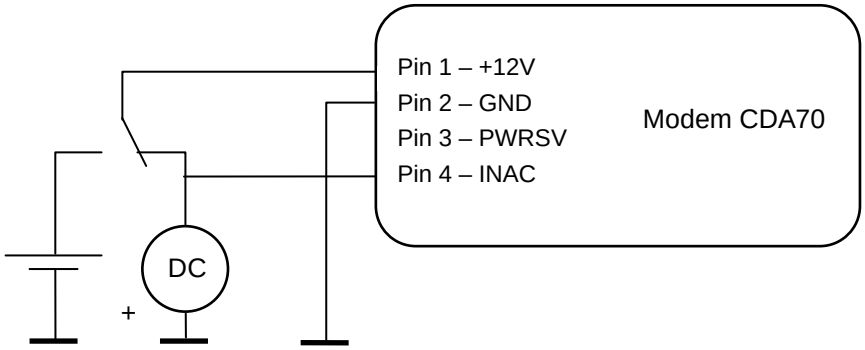
Beware, on INAC (NAP230) input it isn't possible connect link voltage 230 V direct!

Circuit example:

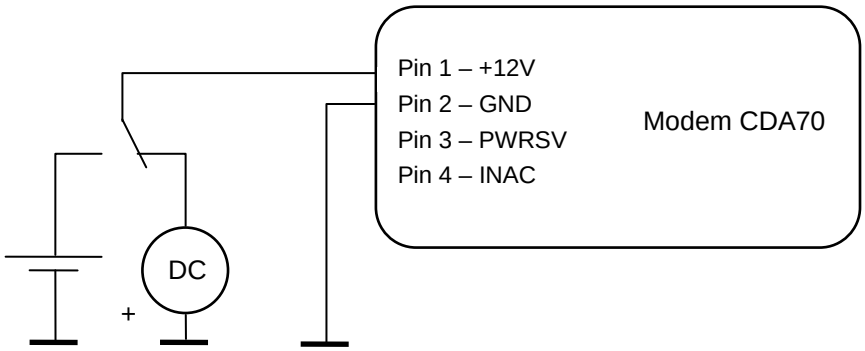
DC supply



DC supply with backup battery with present supply monitoring



DC supply with backup battery without present supply monitoring



2.6. Antenna connection

Antenna is connected to the radio data modem via a BNC connector located on the side panel.

2.7. Power supply

Supply voltage working range of the radio modem is +10.8 to +15.6V dc (12V accumulator). Current consumption during reception is 190 mA. During transmission, current consumption depends on the transmission output (1500 mA for 5 W). For proper function, it is necessary that the power source can supply peak current of 2000mA.

2.8. Ports technical specifications

- RS232

Name of product	RS232	
Power supply	Internal	....
Environment	Operating temperature	-20 .. +55 C
	Storage temperature	-20 .. +85 C
Standards	Emission	EN 55022/B
	Immunity	ETS 300 342
	Safety	EN 60950
RS232 specifications (EN 1434)	Max. operating bus current	15 mA
	Max. bit rate	230400 bps
	Max. overvoltage	±30 V
	Max. total cable length (300Bd, 200nF/km)	20 m

- RS485

Name of product	RS485	
Power supply	External	10,8 .. 15,6 V
	Internal	....
	Supply power	Max. 30 W
	Supply current	Max. 250 mA
Environment	Operating temperature	-20 .. +55 C
	Storage temperature	-20 .. +85 C
Standards	Emission	EN 55022/B
	Immunity	ETS 300 342
	Safety	EN 60950
RS485 specifications (EN 1434)	Max. devices (each 1,5 mA)	256
	Max. bit rate	38400 bps
	Overload detection	250 mA
	Short circuit strength	Permanent
	Max. total cable length (300Bd, 200nF/km)	1200 m

- MBUS

Name of port	MBUS	
Power supply	Voltage	10,8 .. 15,6 V
	Supply power	Max. 30 W
Environment	Operating temperature	-20 .. +55 C
	Storage temperature	-20 .. +85 C
Standards	Emission	EN 55022/B
	Immunity	ETS 300 342
	Safety	EN 60950
M-Bus specifications (EN 1434)	Max. devices (each 1,5 mA)	30
	Max. operating bus current	60 mA
	Overload detection	100 mA
	Short circuit strength	Permanent
	Bus voltage mark	36 .. 43 V
	Bus voltage space	24 .. 31 V
	Max. total cable length (300Bd, 200nF/km)	1000 m

- Ethernet

Port	ETH	
Power supply	Internal	...
Environment	Operating temperature	-20 .. +55 C
	Storage temperature	-20 .. +85 C
Standards	Emission	EN 55022/B
	Immunity	ETS 300 342
	Safety	EN 60950
Ethernet specification	Max. virtual communicate channels number	6
	Max. bit rate	100 Mbps
	Max. total cable length (300Bd, 200nF/km)	100 m

2.9. Configuration of radio modem

The Radwin configuration program **[1]** has been designed to set up the CDA70 radio data modem. The software is created for MS WINDOWS NT/98/ME/2000/XP/Vista platforms. See **User manual - Radwin software** for description of the software. A service cable is designated to connect the modem with a PC. After the service cable is connected to any of the three RS232 serial ports and the service SW runs on the connected PC, it is possible to execute not only all the needed radio modem settings but service interventions in the radio data network as well.

Data cable KD-2

2.10. Service cable

CDA70 - PC connection cable with DCR and GND signals connected at 100 Ohm. It is made from normal data cable by adding service interconnection. It is necessary to interconnect all eight signals between CDA 70 and PC. See description of the RJ45 connector in chapter **2.5.1**.

Service interconnection to the data cable

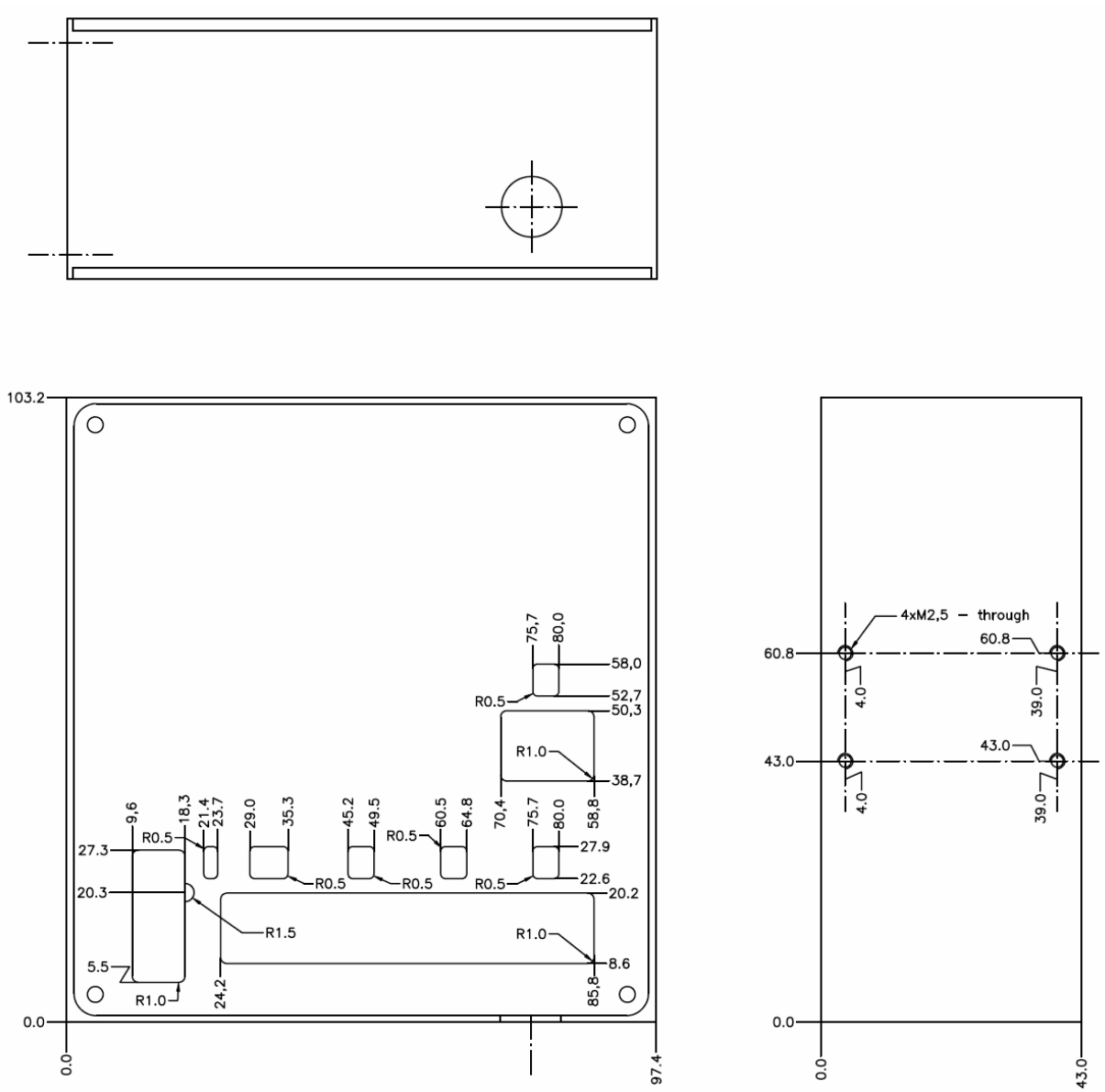
2.11. Accessories

1. Power supply connector for a power supply cable
2. Three RJ45 connectors to complete the data cable by snapping to the cable.
3. Compliance certificate
4. Complaint procedure
5. Warranty

2.12. Additional accessories

1. CIO-ReO-2 – expansion module with relay output
2. CIO-OpI-2 – expansion module with binary input
3. CIO-AnI-2 – expansion module with analogy input
4. KD-51 cable for CIO modules connection

2.13. Mechanical drawing of CDA70 and recommendations for montage



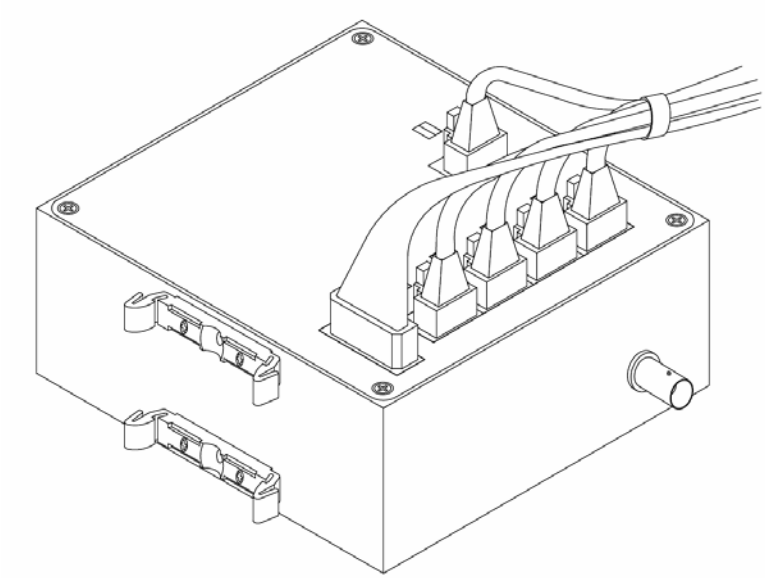
For the majority of applications with a built-in modem in a switch board it is possible to recognize two sorts of environments:

- nonpublic and industry environment of low voltage with high interference,
- public environment of low voltage without high interference.

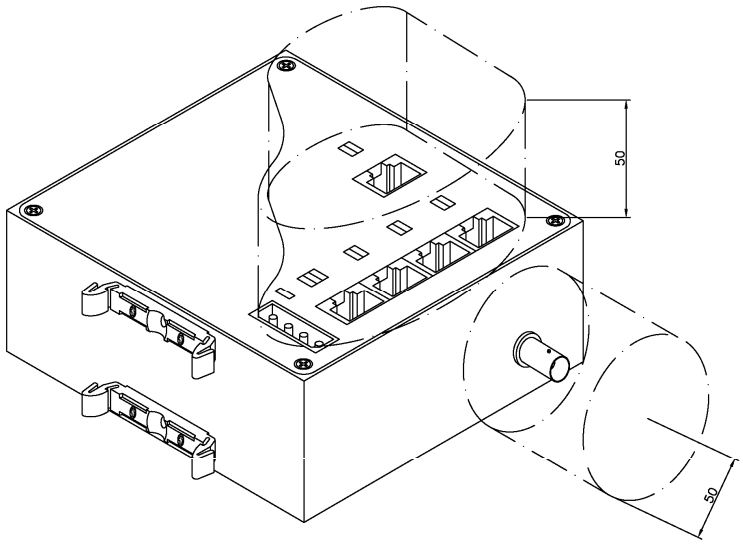
For both of these environments it is possible to mount modems to the switch board, which it doesn't need to have no examination immunity or issues in connection with EMC according to EN 60439-1+A1.

For compliance of EN 60439 - 1 + A1 specification it is necessary observe next assembly of the modem to the switch - board:

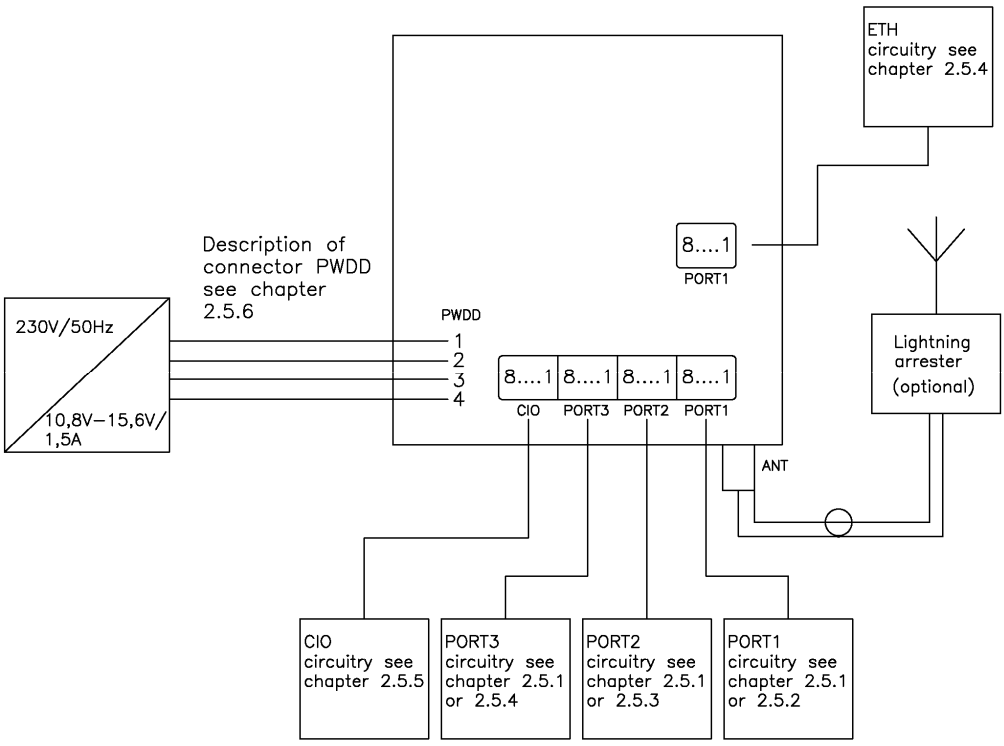
- round antenna we recommend to observe a distance of 6 cm from cables and metal surfaces on every side according to the next picture due to the elimination of interference, while using an external antenna except for the switch-board it is necessary to fit a lightening conductor,
- for single cables we recommend to bind the bunch according to the following picture, for this use we recommend:
  - length of the bunch (combination of power supply and data cables) can be maximum 1,5 m, if length of data cables exceeds 1,5 m or in the event of, the cable leads towards the switch - board, we recommend to use fit over – voltage protectors (surge suppressors),
  - with data cables they mustn't carry cable with reticular tension ~ 230 V/50 Hz,
  - all signals to sensors must be twisted pair.



- sufficient space must be left before individual connectors for handling of cables,



- for correct function of the modem we recommend to use in switch - board earth-bonding distribution frame for grounding of power supply of modem, data cables and antenna,
- the circuit diagram of modem is on the following pictures.



2.14. Product marking

Marking	Antenna connector	Power supply	Other
CDA-70-XX-YY	BNC	+10,8 to 15,6 V DC	CIO

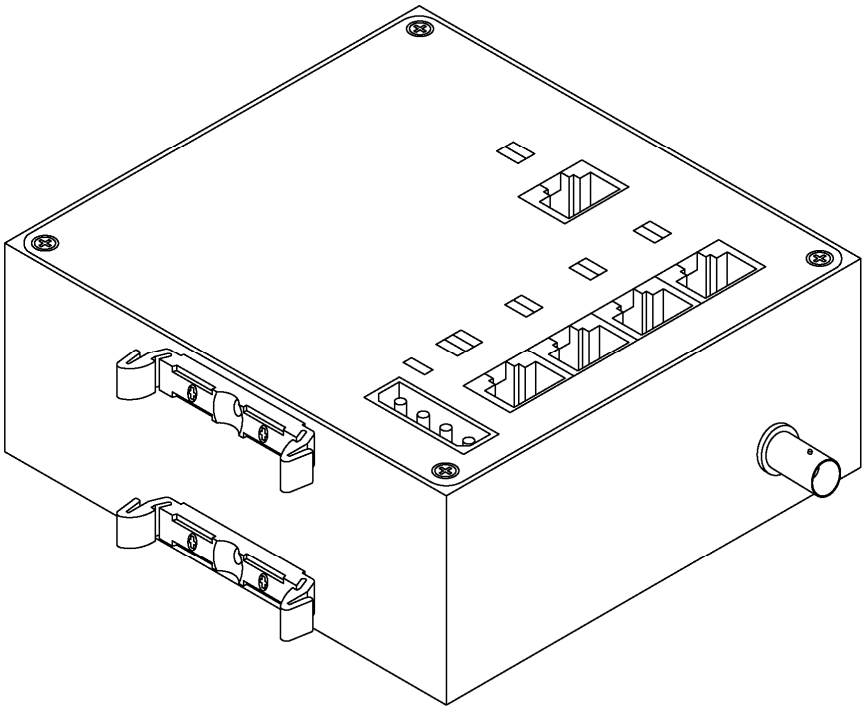
XX – frequency band	U V	403 to 470 MHz 143 to 174 MHz
YY – port configuration	3 4M E EM C 4	3x RS232 1x MBUS + 1x RS485 + 1x RS232 1x Ethernet + 3 x RS232 1x Ethernet + 1x MBUS + 1x RS485 + 1x RS232 1x CAN 1x RS232 + 2x RS485

Example: CDA-70-U-3 is radiomodem for band 403-470 MHz with 3x RS232.

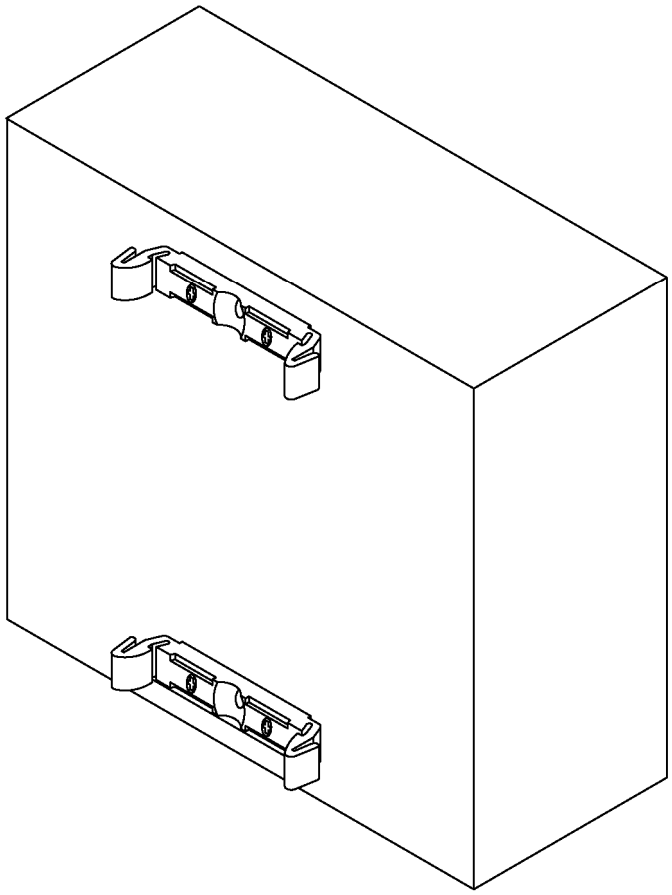
2.15. Assembly procedure

The radio data modem CDA70 is designed as a standard for:

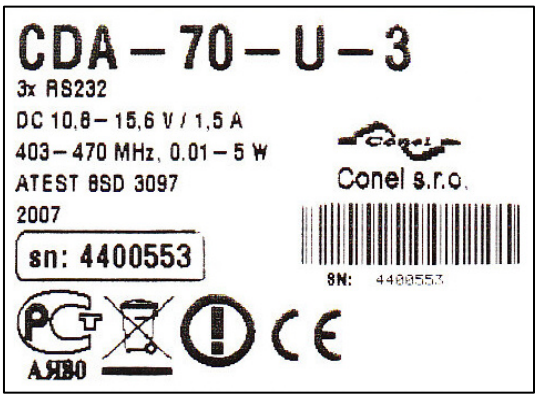
1. DIN 35 mm rail assembly using plastic grips.

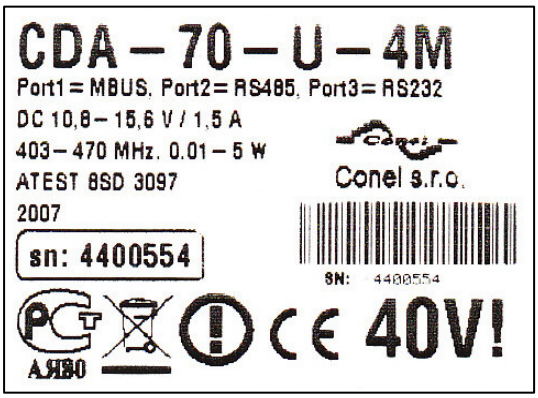


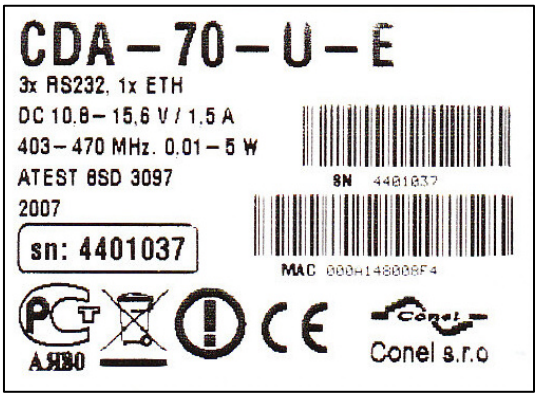
2. DIN 35 mm rail assembly using plastic grips from back side.

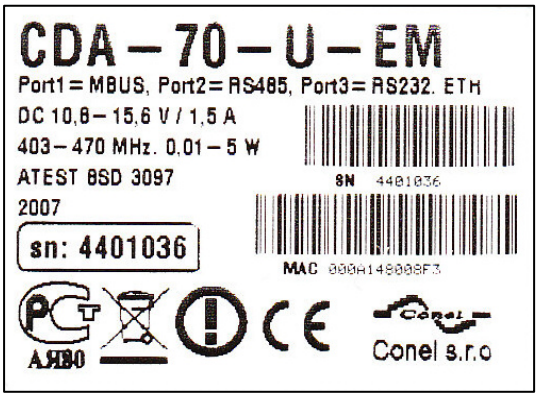


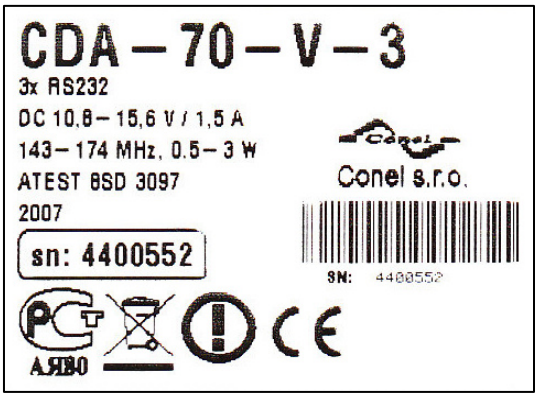
2.16. Product label

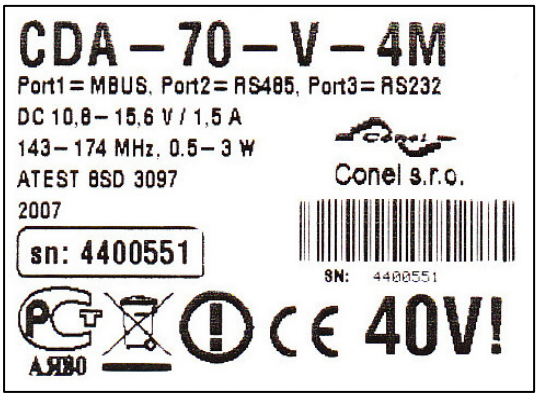


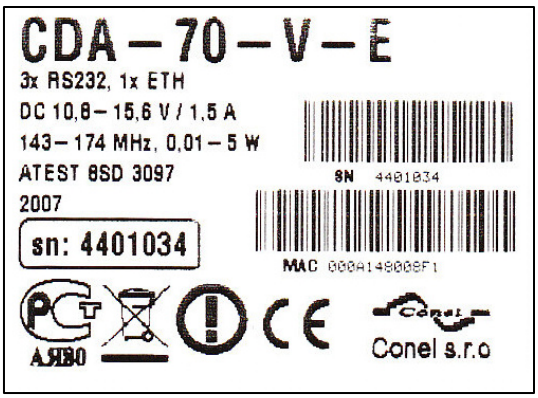


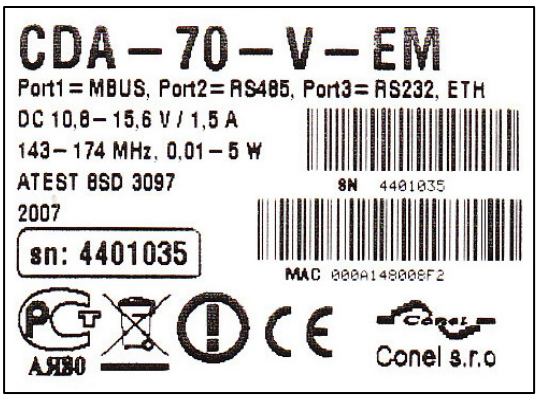












3. CIO - analogue inputs and binary outputs

3.1. Introduction

CDA70 is equipped with a user interface (I/O) for scanning and processing of analogue signals and for controlling (setting) of binary signals. The user can use five adjustable inputs outputs, which are placed on the I/O connector at the back panel of the module. It is possible to use INAC (INAC) signal on the supply connector for checking the presence of DC voltage for power source (can be functional only if there is accumulator supply backup). Output binary signal PWRSV is linked on the same connector (open collector) for automatic disconnection of the whole device from supply voltage. The signal can be used for applications where minimizing of electric power input is crucial. Internal analogue values accessible to the user are also included in the concept of external signal processing and control. These are represented by values of direct supply voltage on the CDA70 (UN+) input and temperature inside the module (TEP).

3.2. Description of multi-purpose signal evaluation and reception

On the input/output, there are five signals, which can be processed and controlled by settings of the CIO module. It is possible to control these signals remotely or to send their values in the data form to a remote location of a data network.

Each of the five signals can be configured as an analogue input, binary input or binary output. All five signals may also be set individually as necessary. Some signals can be input and other can be output at the same time.

3.2.1. Analogue input

Every 100 msec, the voltage value of the analogue input is read, converted to a digital decabit value and adjusted by the calibration constant. The value is further average computed according to user setting and saved in the computer memory. The basic range of the input voltage is 0 to 5V.

Following a signal change by a value bigger than the default hysteresis, a change event is generated. The change under defined module settings generates report on values of all active signals and sends it to the defined destination.

Even if the input signal is analogue-processed, it has a binary interpretation saved in the memory. This is created by comparing the signal value to the control level set. At CIO data reception, both analogue and binary values of active signals are saved to the report. It is possible to set CIO parameters in order that the resulting binary value is inverted.

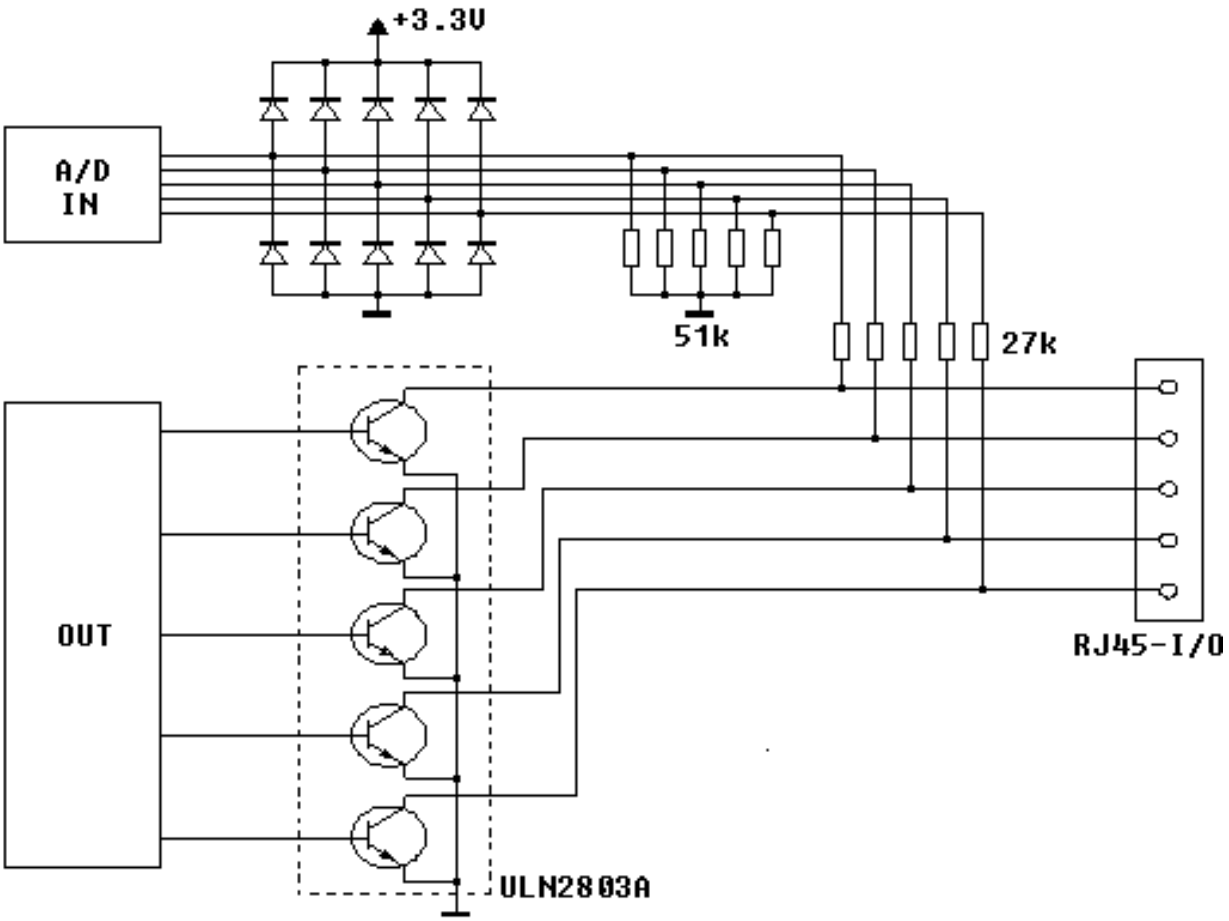
3.2.2. Binary output

Binary output is implemented by a transistor with open collector connected to I/O signal. When inactive (log 0), the transistor does not conduct and acts like an opened switch. When active (log 1), the transistor acts like a switch connecting the I/O signal to the ground (GND). In both cases, the I/O value is measured as an analogue input too. The status of the switched circuit is being checked this way.

Maximum switched current of the output is 500mA. Maximum voltage allowed at the transistor collector equals the supply voltage of the modem.

It is possible to set the CIO parameters so that the binary value is inverted.

3.2.3. I/O signals inside CDA70



I/O signals wiring diagram

3.2.4. I/O signals parameters

Signal name	Measuring range [V]	Resolution [bit]	Sampling [msec]	Average from samples	Hysteresis	Control level
I/O1	0 to 5	10	100	Optional 1 - 128	Optional 0 - 255	Optional
I/O2	0 to 5	10	100	Optional 1 - 128	Optional 0 - 255	Optional
I/O3	0 to 5	10	100	Optional 1 - 128	Optional 0 - 255	Optional
I/O4	0 to 5	10	100	Optional 1 - 128	Optional 0 - 255	Optional
I/O5	0 to 5	10	100	Optional 1 - 128	Optional 0 - 255	Optional

3.3. Measuring other CDA70 signals

3.3.1. Measuring the supply voltage

In CDA70, two more signals are evaluated. The first one is called UN+ (DC SUPLY); it is an internal one and it measures the supply voltage at the supply terminals of CDA70. The measuring range is 0 to 20V. The supply voltage value influences the function of CDA70. If it drops under the set value, the VF module is disconnected because its correct function is no longer secured and thereby, at the same time, the discharge current of a backup battery (if used) is decreased.

The second one is INAC (AC SUPLY) linked to the supply connector (see the supply connector description). The measuring range is 0 to 20V. The signal is protected against overvoltage by a protective element, which blocks the voltage higher than 16V. INAC is designed for measuring of network supply voltage presence. A change of the value is recorded into CDA70 statistics as a dropout and start (rise) of the 230V supply voltage.

Beware - it is impossible to connect 230V supply voltage directly to the input!

Signal name	Measuring range [V]	Resolution [bit]	Sampling [msec]	Average from samples	Hysteresis	Control level
UN+	0 to 30	10	5000	4	2V	Optional
INAC	0 to 30	10	5000	4	2V	Optional

3.3.1.1. Conversion formulas for voltage measurement

U = 215 * AD / 1024 [0.1 V]

AD = 1024 * U / 215

Whereas: AD…analogue/digital converter value

U …voltage measured

3.3.2. Measuring internal CDA70 temperature

The temperature measuring inside the CDA70 unit is performed to secure correct function of the radio module. If the temperature exceeds the set decision level, the VF module is disconnected from the supply voltage, because its correct function is no longer guaranteed above such temperature. At the same time, it is thus protected against damage due to thermal overload.

Signal name	Measuring range [°C]	Resolution [bit]	Sampling [msec]	Average from samples	Hysteresis	Control level
TEP	-40 to 100	10	5000	16	2 °C	Optional

3.3.2.1. Conversion formulas for temperature measurement

T = 625 * AD/128 – 2730 [0.1 °C]

AD = 128 * (T + 2730) / 625

Whereas: AD…analogue/digital converter value

T …temperature measured

3.3.3. Measuring DSR output signal level

On CDA70 side, DSR signals on individual user interfaces are output signals. They are not internally controlled. Individual signals are connected via 560 ohms resistors to the 12V supply voltage (the same voltage as at the supply connector of CDA70).

Due to the loading of DSR output by a 100 ohm resistor to the earth, the supply voltage on the output drops to 2V. CDA70 recognises the connection of the service cable and initiates the communication on this user interface using the ARNEP protocol with defined communication parameters. It is forbidden for user applications to load the output so that the

voltage would drop below 3V. The signal can be used for user applications within the range of 3V to 12V.

As well as the other signals, DSR values are accessible within CIO communication reports (see the ARNEP protocol description).

3.4. Output signal for disconnection of supply voltage

The only exclusively "output" signal is PWRSV (Power Save). The signal is linked to the supply connector (see the supply connector description). It is connected as universal I/O signal outputs. This is an open collector that switches PWRSV signal to the ground (GND). The output is controlled by a report, similarly to I/O outputs.

The basic function is the possibility to switch off the supply in case of an application supplied solely from the accumulator, requiring minimum possible consumption. CDA70 performs communication after which it switches the supply off. The supply has to be switched on again by a user device in case the communication is required.

In general, this output can be used to control technology.

3.5. Technical parameters

Number of I/O signals on I/O port	5
Basic range of the analogue input supply voltage	0 to 5V
Maximum switched current of binary output	500 mA
Maximum switched voltage of binary output	30 V

3.6. Setting CIO parameters

3.6.1. Activation of CIO signals

All CIO signals have activity feature. In case a signal is active, its value is recorded in the CIO status report. Only when the active signal changes, CIO may automatically generate a corresponding report. In case a signal is not set as active, no matter how big a change, it will not generate any change feature.

3.6.2. CIO communication parameters

The CIO block functions in every CDA70, independently of settings of user interfaces. CIO communication parameters settings decide whether the information on measured signal values will be sent to a remote user interface.

From the communication viewpoint, the CIO operates in two modes: in the passive mode, CIO sends measured information only upon the request of a remote station. In the active mode, messages are generated based on changes of measured active signals, or regularly according to a set time period.

For the method of requesting CIO values, see the ARNEP protocol.

3.6.3. CIO active mode parameters

Parameter name	Set values range	Meaning of parameter
Auto operation	YES/NO	In case the parameter is set to (YES), CIO operates in the active mode and the following parameters will influence its function. In the other case, the following parameter settings have no influence over CIO function. There are two exceptions: "NulTime On" and "NulTime" parameters, which are connected with the functioning of outputs and are independent of the "Auto operation" parameter.
After-change report	YES/NO	When set to (YES), CIO generates the report always when there is a change to any active signal, power supply and temperature too, by a value higher than hysteresis.
Send to CIO	YES/NO	When set to (YES), the report is sent to a defined remote CIO block. The remote CIO block settings must be appropriate. It is possible to send the report either to a remote CIO block, or to a remote user interface. Using both options simultaneously is impossible.
Send to port	YES/NO	When set to (YES), the report is sent to a defined remote user interface. The protocol settings of the remote CDA70 user interface must be appropriate. It is possible to send the report either to a remote CIO block, or to a remote user interface. Using both options simultaneously is impossible.
Second station	YES/NO	If the parameter is set to (YES), the message is also sent to the other (the second) remote CDA70. All other set parameters are the same for both destination addresses.
NulTime On	YES/NO	The parameter affects output I/O signals. If set to (YES), the value of outputs is correct, if its regular renewal is being performed from a remote CDA70 in a shorter period than set in the NulTime parameter. In case the module does not accept the new output value within the time, the outputs are set to inactive mode. The method protects connected technology in case of unwanted communication failure. In case the parameter is not set (NO), automatic zeroing of outputs will not be applied. Parameter function does not depend on the "Auto operation" parameter setting.
COM	1 to 3	The parameter defines number of source module user interface according to which source address will be included in the report.

Log. number 1	1 to 254	Destination address of the first user interface where CIO-generated report will be sent.
Log. number 2	1 to 254	Destination address of the second user interface where CIO-generated report will be sent.
MinTime [msec]	0 to 6553500	Time hysteresis after which CIO may generate new report The shortest period for transmitting the reports.
MaxTime [msec]	0 to 6553500	Period after which CIO always generates the report, even when there is no change of an active signal.
NulTime [sec]	0 to 2550	A timeout for regular setting of outputs. See the NulTime On parameter.

3.7. Connecting CIO signals to user device

It is not appropriate and often even possible to connect I/O interface signals directly to the user device. To measure current, resistance, broader ranges of voltage, it is necessary to insert electronic circuits, which adjust the measured quantities to voltage ranging from 0 to 5V and also protect inputs against disturbing influences and dangerous overvoltage. Moreover, it is also necessary to insert electronic circuits for operating the power parts of the user interface because a transistor with the open collector is able to switch current up to 500mA and voltage up to 20V.

Two additional CIO modules, which form an interface between a user's device and I/O signals, are created for the practical use of I/O signals

Name	Type	Description
CIO ANI	Analogue input	Analogue differential input for small voltage, current and resistance measuring. It includes differential amplifier with adjustable power 1 to 10000. Exact current source 0.1 to 3 mA can be used to measure resistance. Configuration of the input signals, amplification and current source is carried out through resistance net. Presence of the input signal relevant to A/D converter working range is signalled by LED on the front panel. Input circuits are protected against short-time over voltage by suppressors and against the long-time one by a reverse fuse. Ranges of the measured values: U 1V, U 2V, U 5V, U 10V, U 20V I 5mA, I 10mA, I 20mA Pt100 100°C, Pt100 200°C, Pt100 500°C Resistance 100 to 50000 Ohm (METRA transmitter)
CIO OPI	Binary input	A single galvanic-separated digital input used for direct and alternate signals up to 30V. It includes a bipolar opto-element that enables processing of both input signal polarities. For AC signal, it includes

		integration circuit that provides for direct processing of 50 Hz signal. Output logical value of the measured signal is LED signalled on the front panel. Input circuits are protected against short-time over voltage by suppressors and against the long-time one by a reverse fuse. Input D.C. voltage of 3-30V Input A.C. voltage of 3-30V rms
CIO REO	Binary output	A single relay output. It includes a relay with a single changeover contact. The changeover contact terminal is separate, common contact is doubled (marked as C). The LED signals the presence of the governing signal of the relay. Maximum constant voltage 230V rms Maximum constant current 5A rms

4. Reference

[1] Conel s.r.o.: *RADWIN Programme for control AGNES*, 2007

[2] Conel s.r.o.: *Aplication CGU Server*, 2004

5. Links to related products of the manufacturer

For related and referenced products and material, see the Conel website:

www.conel.cz

5.1. *Systems*

AGNES - a comprehensive communication system made by Conel.

5.2. *Protocols*

ARNEP – Advanced Radio Network Protocol – one of AGNES protocols.

5.3. *Software*

RADWIN - this software provides for creation, installation and administration of data networks.

5.4. *Products*

CDM70 - radio data modem, the foregoer of CDA70.

CDM70L - radio data modem for shared band.

6. Complaints procedure

Dear customer,

The product you have purchased had passed manufacturer's tests and its functions had been checked by our technician before sale. In case any defect shows up during the guarantee period that prevents normal use we ask you to follow the Complaints procedure when registering your claim.

To make a possible complaint procedure easier please make sure when taking over the product that your vendor has duly filled in all the relevant parts of the warranty, including date, seal and signature.

This Complaints procedure relates to the purchased products. This Complaints procedure does not relate to the services provided.

Guarantee period of the products

Guarantee period of 24 months from the date of purchase is provided for the device, source, antenna, data cable and possible accessories. The date of purchase is at the same time date of takeover.

Registering a claim

It is necessary to register your claim at the vendor where the subject of the complaint has been purchased. Customer shall present duly filled warranty and the complete subject of the complaint. Subject of the complaint shall be presented in a condition adequate to that at the moment of purchase.

Caution!

The vendor is not responsible for keeping individual settings or data saved in the subject of the complaint.

The customer is obliged to clarify the defect or how it is displayed and what claim he intends to register.

Processing the complaint

The vendor shall provide free remedy depending on particular conditions, or replace the subject of the complaint for a new product, or settle the matter in another manner in compliance with the Civil Code and the Act on consumer's protection.

As of the moment the claim is registered by the customer and the subject of the complaint is taken over by the vendor the guarantee period stops running. The guarantee period continues on the date of takeover of the repaired subject of the complaint or replaced faultless product by the customer, or should it not be taken over on the date the customer is obliged to take over the repaired or replaced product. In case the vendor replaces the subject of the complaint for a new product, the original subject of the complaint becomes property of the vendor and the new product becomes property of the purchaser. New guarantee period starts from takeover of the new product. In cases when the vendor settles the matter upon agreement with the customer by replacement of the subject of the complaint for a faultless product, the new guarantee expires

1. After 12 months since the replaced product was taken over by the customer.
2. On the date when the original guarantee period (subject of the complaint) would have expired should it not have been replaced, whichever comes first.

3. The claim is deemed unsubstantiated when the defect is not found by the vendor processing the complaint or the defect is not covered by the guarantee under Article 3 of the procedure.
4. In case the claimed defect is not found and functionality is proven to the customer, the customer is obliged to pay demonstrable cost related to expert assessment of the claimed defect.
5. In case defect is found when processing the complaint that is not covered by the guarantee (extra-warranty repair), the vendor shall inform the customer and the customer shall inform the vendor whether he/she wishes to have the defect repaired for the price set. A protocol shall be made on exact conditions of the extra-warranty repair and signed by both the customer and the vendor. Should the customer not require remedy through extra-warranty repair under the conditions, the device shall be returned to him/her after he/she pays the demonstrable cost of expert assessment.

The guarantee does not cover defects due to

1. Mechanical damage (fall and the like).
2. Use of inadequate or not recommended sources and other accessories.
3. Connection of the product with non-standard accessories.
4. Installation or use of the product conflicting with the Manual or use for other purposes than usual for this type.
5. Improper manipulation, or an intervention of unauthorised person or other service than authorised by the manufacturer.
6. Effects of natural forces (flood, fire etc.) or other local phenomena) storm, mains over voltage and the like).
7. Storage under unauthorised temperatures.
8. Operation in a chemically aggressive environment.

Other conditions

The fact the subject of the complaint does not conform to parameters set for other similar product types shall not be considered a fault. To assess whether it is a case of covered fault the parameters stated in the technical documentation for the product are decisive.

The guarantee expires in any case of changes to the subject of the complaint or damaged or otherwise unreadable serial number.

7. Warranty

Device type	
Serial number	
Guarantee period (months)	
Vendor	
Date of purchase	
Seal of the vendor	

	1	2	3	4	5
Date of complaint registration					
Complaint protocol number					
Date of reception of the device in repair shop					
Date of finished repair					
Number of repair sheet					
Warranty repair	YES - NO	YES - NO	YES - NO	YES - NO	YES - NO
New serial number of the device					
Notes					
Seal of the repair shop					